

Technische Information / Technical Information

IGBT-Module
IGBT-Modules

BSM150GAL120DLC

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Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung collector-emitter voltage		V_{CES}	1200	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80^\circ\text{C}$ $T_C = 25^\circ\text{C}$	$I_{C,nom.}$ I_C	150 300	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\text{ ms}$, $T_C = 80^\circ\text{C}$	I_{CRM}	300	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^\circ\text{C}$, Transistor	P_{tot}	1,2	kW
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	150	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1\text{ ms}$	I_{FRM}	300	A
Grenzlastintegral der Diode I^2t - value, Diode	$V_R = 0\text{V}$, $t_p = 10\text{ms}$, $T_{vj} = 125^\circ\text{C}$	I^2t	4,8	kA^2s
Isolations-Prüfspannung insulation test voltage	RMS, $f = 50\text{ Hz}$, $t = 1\text{ min.}$	V_{ISOL}	2,5	kV

Charakteristische Werte / Characteristic values

Transistor / Transistor

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$I_C = 150\text{A}$, $V_{GE} = 15\text{V}$, $T_{vj} = 25^\circ\text{C}$	$V_{CE\text{ sat}}$	-	2,1	2,6	V
	$I_C = 150\text{A}$, $V_{GE} = 15\text{V}$, $T_{vj} = 125^\circ\text{C}$		-	2,4	2,9	V
Gate-Schwellenspannung gate threshold voltage	$I_C = 6\text{mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25^\circ\text{C}$	$V_{GE(th)}$	4,5	5,5	6,5	V
Gateladung gate charge	$V_{GE} = -15\text{V}...+15\text{V}$	Q_G	-	1,6	-	μC
Eingangskapazität input capacitance	$f = 1\text{MHz}$, $T_{vj} = 25^\circ\text{C}$, $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$	C_{ies}	-	11	-	nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\text{MHz}$, $T_{vj} = 25^\circ\text{C}$, $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$	C_{res}	-	0,7	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 1200\text{V}$, $V_{GE} = 0\text{V}$, $T_{vj} = 25^\circ\text{C}$	I_{CES}	-	7	184	μA
	$V_{CE} = 1200\text{V}$, $V_{GE} = 0\text{V}$, $T_{vj} = 125^\circ\text{C}$		-	700	-	μA
Gate-Emitter Reststrom gate-emitter leakage current	$V_{CE} = 0\text{V}$, $V_{GE} = 20\text{V}$, $T_{vj} = 25^\circ\text{C}$	I_{GES}	-	-	400	nA

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Charakteristische Werte / Characteristic values

Transistor / Transistor

min. typ. max.

Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	$I_C = 150A, V_{CE} = 600V$ $V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 25^\circ C$ $V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 125^\circ C$	$t_{d,on}$	-	0,05	-	μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 150A, V_{CE} = 600V$ $V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 25^\circ C$ $V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 125^\circ C$	t_r	-	0,05	-	μs
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	$I_C = 150A, V_{CE} = 600V$ $V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 25^\circ C$ $V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 125^\circ C$	$t_{d,off}$	-	0,57	-	μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 150A, V_{CE} = 600V$ $V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 25^\circ C$ $V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 125^\circ C$	t_f	-	0,04	-	μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 150A, V_{CE} = 600V, V_{GE} = 15V$ $R_G = 5,6\Omega, T_{vj} = 125^\circ C, L_S = 60nH$	E_{on}	-	17	-	mWs
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 150A, V_{CE} = 600V, V_{GE} = 15V$ $R_G = 5,6\Omega, T_{vj} = 125^\circ C, L_S = 60nH$	E_{off}	-	18	-	mWs
Kurzschlußverhalten SC Data	$t_P \leq 10\mu sec, V_{GE} \leq 15V, R_G = 5,6\Omega$ $T_{vj} \leq 125^\circ C, V_{CC} = 900V, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	I_{SC}	-	950	-	A
Modulinduktivität stray inductance module		L_{sCE}	-	25	-	nH
Modul Leitungswiderstand, Anschlüsse – Chip module lead resistance, terminals – chip	$T_C = 25^\circ C$	R_{CC+EE}	-	0,6	-	m Ω

Charakteristische Werte / Characteristic values

Inversdiode / Free-Wheel Diode

min. typ. max.

Durchlaßspannung forward voltage	$I_F = 150A, V_{GE} = 0V, T_{vj} = 25^\circ C$ $I_F = 150A, V_{GE} = 0V, T_{vj} = 125^\circ C$	V_F	-	1,8	2,3	V
Rückstromspitze peak reverse recovery current	$I_F = 150A, -di_F/dt = 3100A/\mu sec$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$	I_{RM}	-	180	-	A
Sperrverzögerungsladung recovered charge	$I_F = 150A, -di_F/dt = 3100A/\mu sec$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$	Q_r	-	17	-	μAs
Abschaltenergie pro Puls reverse recovery energy	$I_F = 150A, -di_F/dt = 3100A/\mu sec$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$	E_{rec}	-	4	-	mWs

Chopperdiode / Chopper Diode

min. typ. max.

Durchlaßspannung forward voltage	$I_F = 200A, V_{GE} = 0V, T_{vj} = 25^\circ C$ $I_F = 200A, V_{GE} = 0V, T_{vj} = 125^\circ C$	V_F	-	1,8	2,3	V
Rückstromspitze peak reverse recovery current	$I_F = 200A, -di_F/dt = 4000A/\mu sec$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$	I_{RM}	-	240	-	A
Sperrverzögerungsladung recovered charge	$I_F = 200A, -di_F/dt = 4000A/\mu sec$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$	Q_r	-	23	-	μAs
Abschaltenergie pro Puls reverse recovery energy	$I_F = 200A, -di_F/dt = 4000A/\mu sec$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$	E_{rec}	-	6	-	mWs

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Thermische Eigenschaften / Thermal properties

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	R_{thJC}	-	-	0,1	K/W
	Diode/Diode, DC		-	-	0,25	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{Flussste} = 1 \text{ W/m} \cdot \text{K}$ / $\lambda_{grease} = 1 \text{ W/m} \cdot \text{K}$	R_{thCK}	-	0,01	-	K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		T_{vj}	-	-	150	°C
Betriebstemperatur operation temperature		T_{op}	-40	-	125	°C
Lagertemperatur storage temperature		T_{stg}	-40	-	150	°C

Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix				
Innere Isolation internal insulation			AL ₂ O ₃	
Kriechstrecke creepage distance			20	mm
Luftstrecke clearance			11	mm
CTI comperative tracking index			275	
Anzugsdrehmoment f. mech. Befestigung mounting torque		M1	3	6 Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	terminals M6	M2	2,5	5 Nm
Gewicht weight		G	420	g

Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert.
Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen.

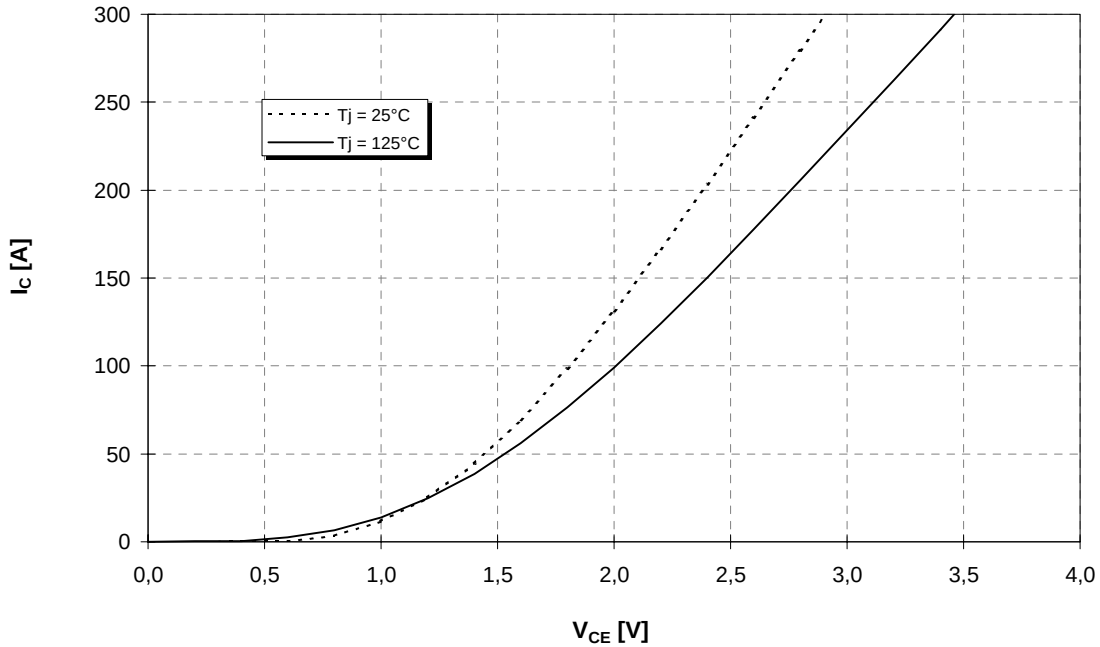
This technical information specifies semiconductor devices but promises no characteristics. It is
valid in combination with the belonging technical notes.



Ausgangskennlinie (typisch)
Output characteristic (typical)

$$I_c = f(V_{CE})$$

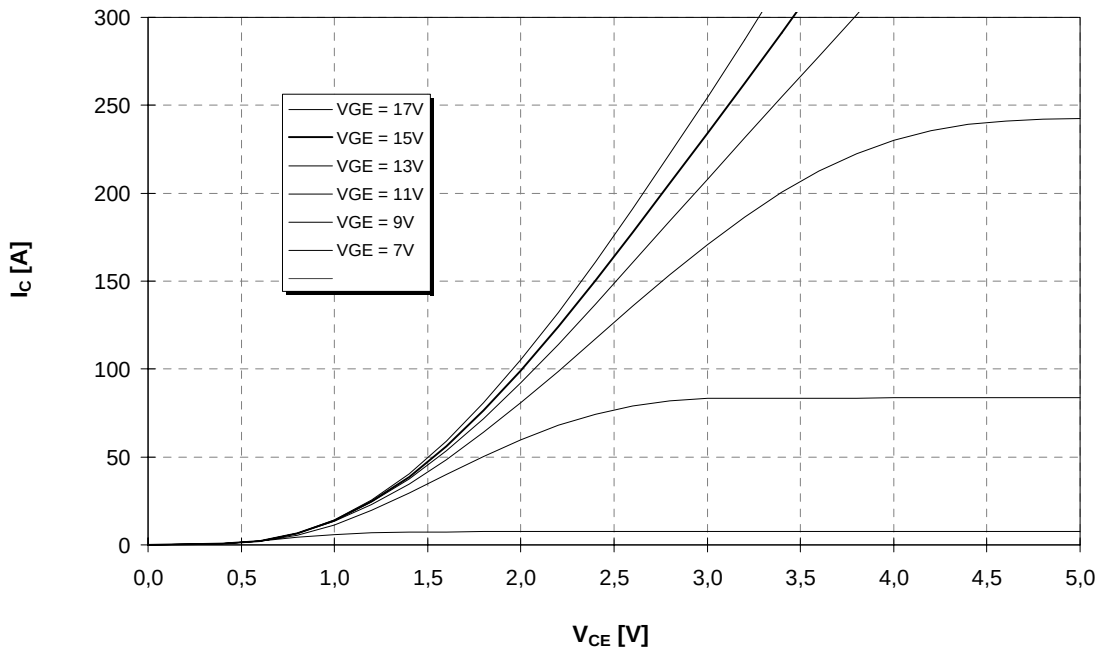
$V_{GE} = 15V$



Ausgangskennlinienfeld (typisch)
Output characteristic (typical)

$$I_c = f(V_{CE})$$

$T_{vj} = 125^\circ C$

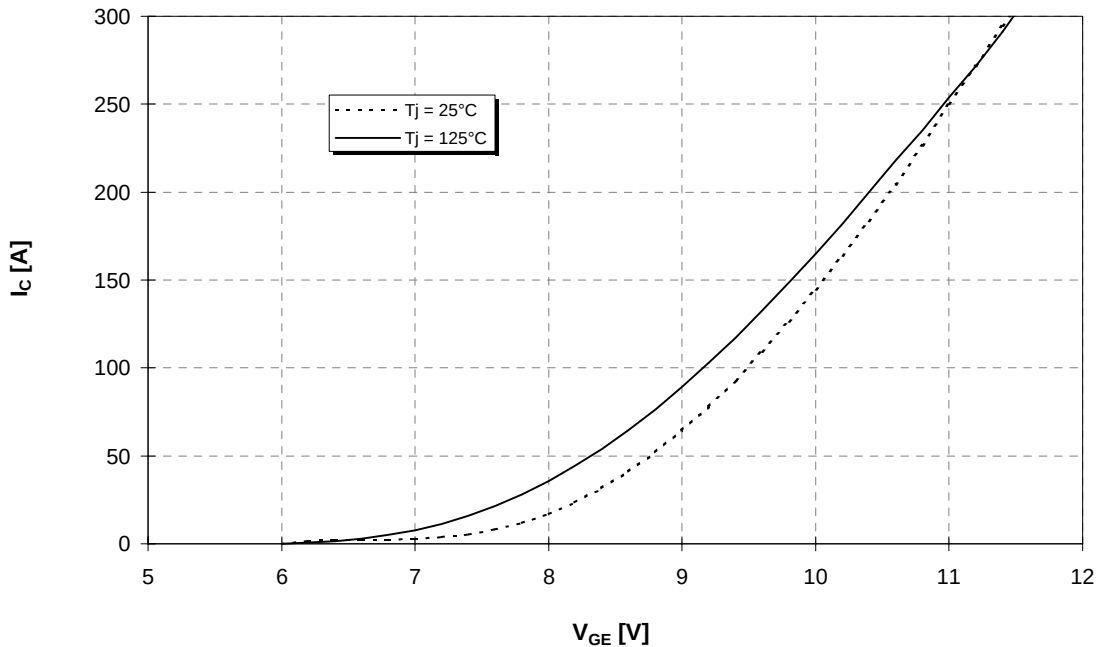




Übertragungscharakteristik (typisch)
Transfer characteristic (typical)

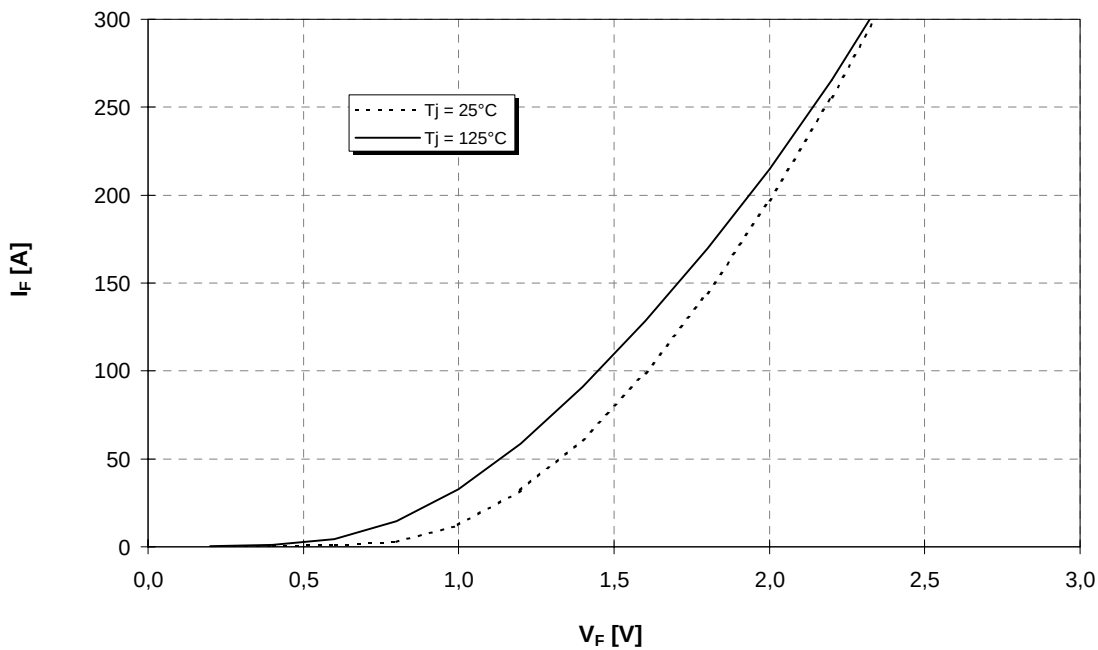
$$I_C = f(V_{GE})$$

$V_{CE} = 20V$



Durchlaßkennlinie der Inversdiode (typisch)
Forward characteristic of inverse diode (typical)

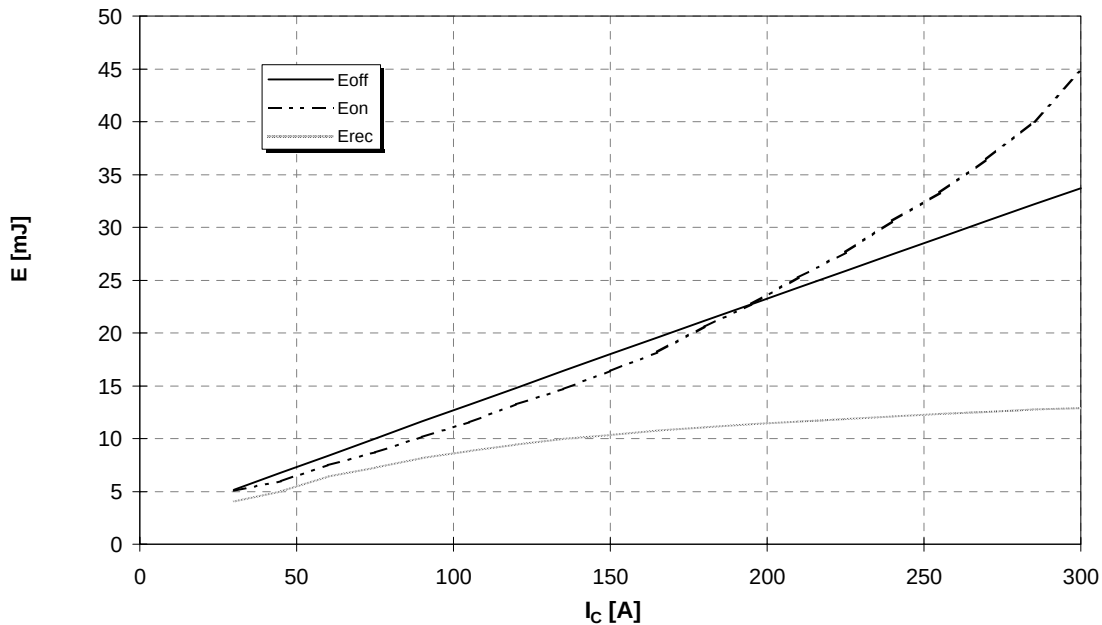
$$I_F = f(V_F)$$





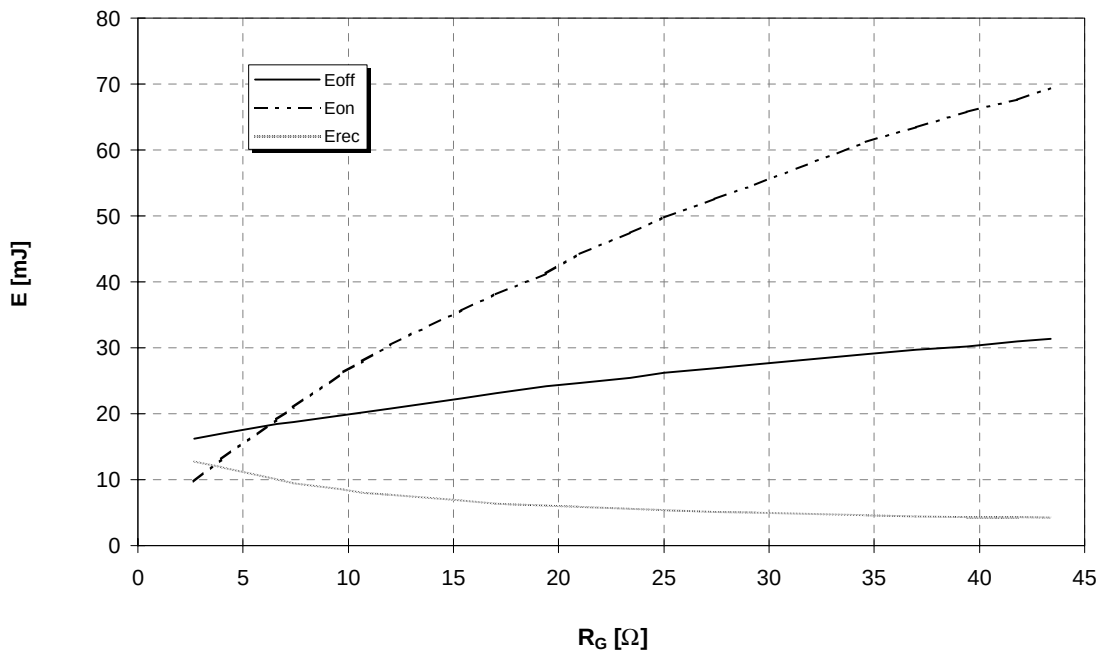
Schaltverluste (typisch) $E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$

Switching losses (typical) $V_{GE}=15V$, $R_{gon} = R_{goff} = 5,6 \Omega$, $V_{CE} = 600V$, $T_j = 125^\circ C$



Schaltverluste (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$

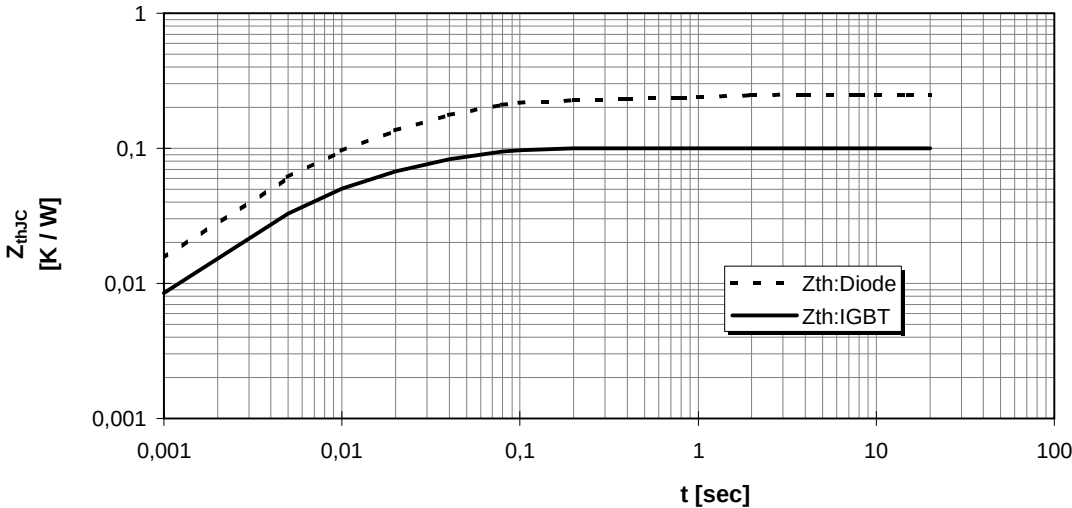
Switching losses (typical) $V_{GE}=15V$, $I_C = 150A$, $V_{CE} = 600V$, $T_j = 125^\circ C$





Transienter Wärmewiderstand
Transient thermal impedance

$Z_{thJC} = f(t)$

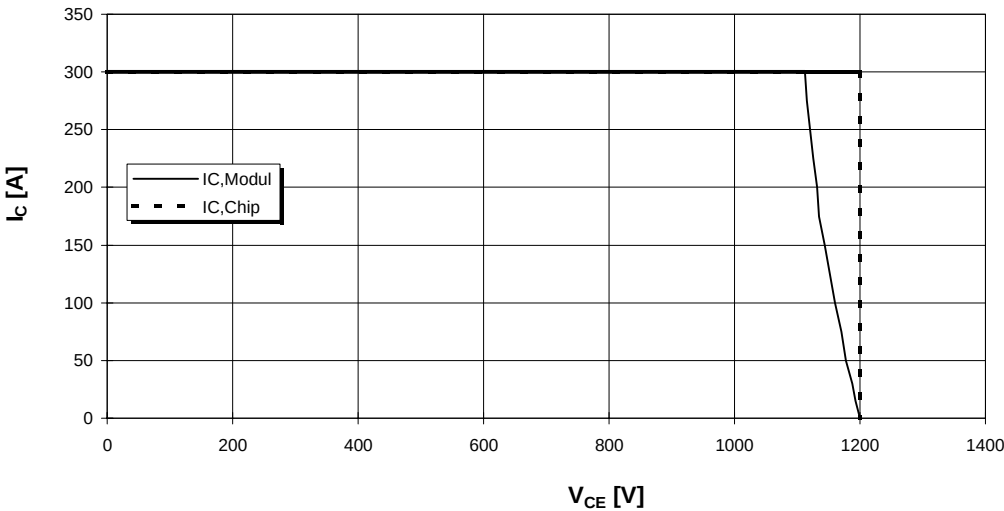


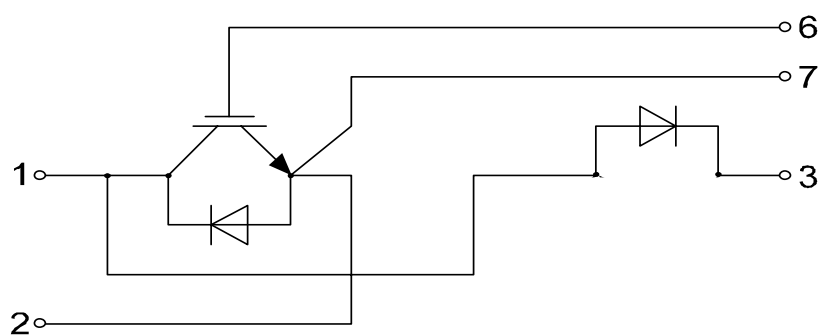
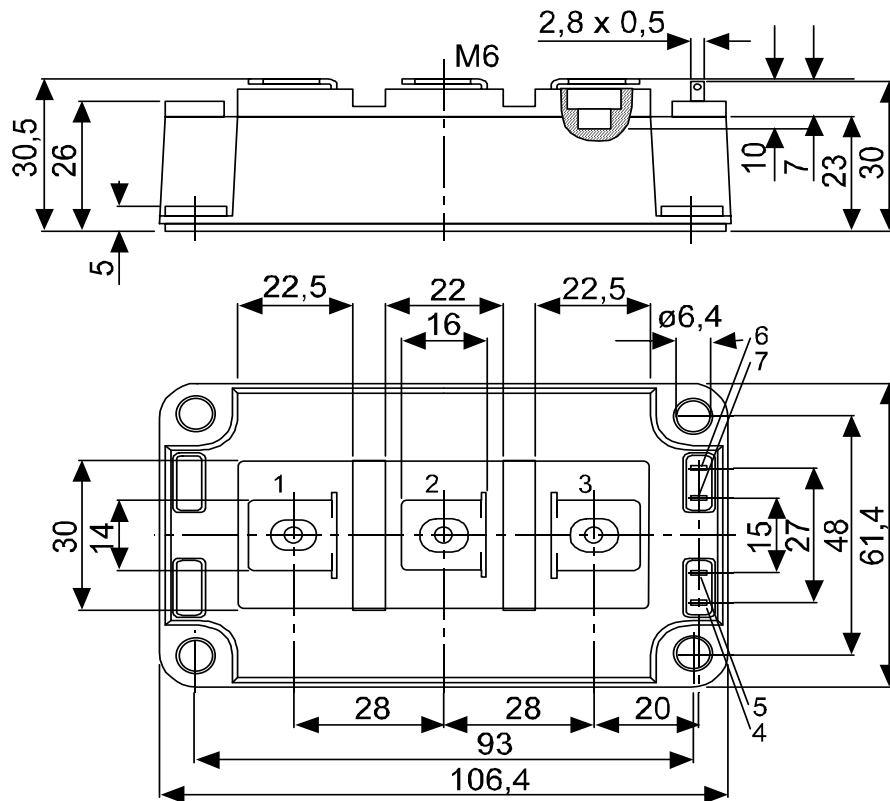
i	1	2	3	4
r_i [K/kW] : IGBT	44,54	33,9	21,52	0,04
τ_i [sec] : IGBT	0,006	0,029	0,043	1,014
r_i [K/kW] : Diode	68,24	101,68	52,66	27,42
τ_i [sec] : Diode	0,006	0,035	0,033	0,997

Sicherer Arbeitsbereich (RBSOA)

Reverse bias safe operation area (RBSOA)

$V_{GE} = 15V, R_g = 5,6 \text{ Ohm}, T_{vj} = 125^\circ C$





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